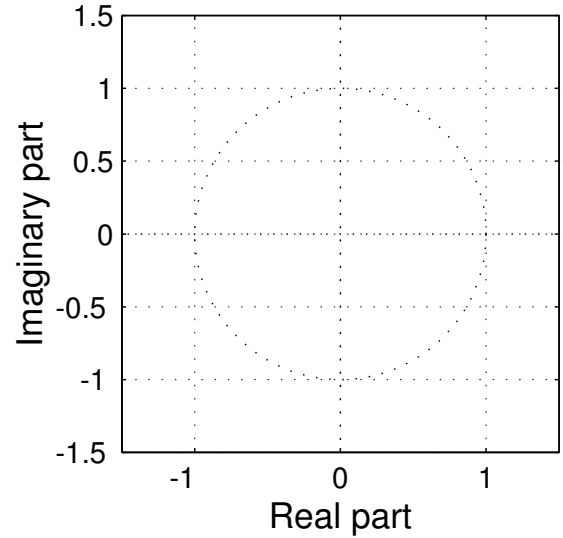
**PROBLEM:**

A discrete-time system is defined by the following system function:

$$H(z) = \frac{1 + z^{-2}}{1 + 0.9z^{-1}} = \frac{1}{1 + 0.9z^{-1}} + \frac{z^{-2}}{1 + 0.9z^{-1}}.$$

(a) Use the first form of $H(z)$ to determine *all* the poles and zeros of $H(z)$ and plot them in the $z$-plane.




(b) Use the second form of $H(z)$ above to find the corresponding impulse response $h[n]$.

(c) Use the first form of $H(z)$ to obtain an expression for the magnitude-squared of the frequency response $|H(e^{j\hat{\omega}})|^2 = H(e^{j\hat{\omega}})H^*(e^{j\hat{\omega}})$. Your answer should involve only real quantities.

(d) For what value (or values) of $\hat{\omega}$ will it be true that $y[n] = 0$ for $-\infty < n < \infty$ when the input to the system is $x[n] = e^{j\hat{\omega}n}$ for $-\infty < n < \infty$?